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पेपर लेपन के लिए प्लास्टिक रहित, जैवीयक्षरित पॉलिमर आधारित लेपन रसायन

Non Plastic, Biodegradable Polymer Based Paper Coating Chemical

ICS 87.040

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भारतीय मानक ब्यूरो
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Paints, Varnishes and Related Products Sectional Committee, CHD 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes and Related Products Sectional Committee had been approved by the Chemical Division Council.

Different kind of paper coating chemicals are used for non-plastic, bio-degradable polymer based paper coating. Thus title may be more suited for the new standard. Under this title, two different products are prescribed:

a) one product will help in manufacturing waterproof paper packages, and
b) the other product will help in making water as well as oil resistant paper packages.

Some of the salient features of the coatings are:

a) Products are based on non plastic, bio-degradable Polymer.
b) Both the products are transparent in nature, so after coating there will be no change in colour of the paper.
c) Products are nontoxic and safe for its use in direct contact with the food articles.
d) After coating on the paper, the BF (Burst Factor) increased by at least 10 to 12 percent.
e) After coating co-efficient of friction get reduced.
f) The cobb value of the paper get reduced. The reduction in cobb depends on the extent of coating applied on the paper. More the coating, more the reduction in cob value. So depending upon the requirement, the extent of coating level may be decided.
g) The coated film is flexible and does not crack by folding.
h) Non pick up of any odour.
j) It can be applied after printing or printing can be done over the coating.
k) It is environmental friendly and coated paper can directly go for recycling.
m) Two types of products are recommended for application. Both the products have waterproofing property but one product is having oil and grease resistant property as well as heat sealing property (A to A). The material is commercially available and being used for almost 17 years and used by different Government, Semi Government, Corporate and other Organisations.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

NON PLASTIC, BIODEGRADABLE POLYMER BASED PAPER COATING CHEMICALS

1 SCOPE

This standard prescribes requirements, method of sampling and tests for the material commercially known as “non plastic, bio-degradable polymer based paper coating chemicals”, intended to be used as paper waterproof coating chemical and paper oil resistant coating chemical.

NOTE — Waterproof coating Chemical is used for those paper packages where the package is to be protected from the attack of moisture so that it does not lose the strength by absorbing moisture and in turn damage the product inside. Application of such product will protect the packed material from attack by outside moisture or the moisture of the packed product is to be retained. Similarly oil resistant coating chemical is used for those paper packages where the package is to be protected from attack by outside oil or the oil in the product is to be retained without damaging the package itself.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard definitions given in IS 1303 and IS 4661 shall apply.

4 CLASSIFICATION

Based on applications, the material has been classified in to two different classes as given below.

4.1 Class – I

The coating chemical under this class is mainly used for making moisture proof paper. The coated paper is mainly used for the following packages:

a) Soap wrapper;
b) Corrugated boxes for fruits, vegetables, flowers etc.;
c) Boxes for tea, ice-cream, butter, milk powder, paneer, cheese, Curd etc.;
d) Corrugated boxes for bidi, cigarette, tobacco etc;
e) Corrugated boxes for garments, fabric, yarn etc;
f) Corrugated boxes for fish, meat and other frozen food export;
g) Multiwall paper bags for moisture sensitive products.;
h) Boxes for ammunition packaging; and
j) Replacement of bituminized paper, wax coated paper and plastic coated paper.

4.2 Class – II

The coating chemical under this class is mainly used for making oil and grease resistant paper. The oil and grease resistant paper is used for the following packages:

a) Wrapper for butter, sweet, snacks and any other milk products;
b) Paper cups and plates;
c) Coating on duplex board in place of PE coating;
d) Coatings for mono cartons;
e) Outer soap wrapper;
f) Boxes for oil cans;
g) Automobile parts containing traces of oil etc; and
h) Bearing box.

5 MANUFACTURE

The manufacturing process of these products are quite different in comparison to other paper coating chemicals. The manufacturing of the graft co-polymer of butadiene is most important step in manufacturing which is responsible for all the special properties of the finished products. Part of the polymer is dissolved with the other ingredients (auxiliary chemicals) in a specific blend of organic solvents. Once this part is dissolved and a homogenous solution is made, the other part of polymer is added with constant stirring to complete the process. Finally it form a homogenous solution. Depending upon the desired final viscosity in both the classes, it will be brought down to the level by dilution and packed as directly usable chemical coating.

6 REQUIREMENTS

6.1 Composition

The composition of coating chemicals shall be such that it satisfies the requirement as prescribed in Table 1.

NOTE — Depending on the end use of the coatings, there may be some variation in formulation but the requirement in Table I to be met in both the cases.

6.2 The material shall be free from any objectionable odour.

6.3 Lead Restriction

The material shall not contain lead or compounds of lead or mixtures of both, as metallic lead more than 90 ppm, when tested for restriction from lead in accordance with IS 101(Part 8/Sec 5).

6.4 The coated paper shall also satisfy the performance requirements as prescribed in Table 2. The tests prescribed in Table 2 are carried out on paper after coating by Class I material at 10 ml/sq. m and Class II material at 20 ml/sq. m.

6.4.1 *Limits of Toxic Substances/Chemicals in Coated Paper*

The limit of toxic substances/chemicals shall not exceed the limits prescribed in Table 3 in coated paper intended for packaging of food materials, when tested according to the methods given in Annex C of IS 2617. Paper shall be coated with coating chemicals as per clause **6.4** before testing.

7 PACKING AND MARKING

7.1 Packing

7.1.1 Unless otherwise agreed to between the purchaser and the supplier, the coating shall be packed in metal container conforming to IS 1407 or IS 2552.

7.1.2 The material when intended for defence purpose, shall be marked in accordance with IS 5661.

7.2 Marking

Each container shall be marked with following:

a) Nomenclature of the material;
b) Name of the manufacturer;
c) Batch number or lot number in code or otherwise;
d) Nature of coating with class;
e) Month and year of manufacture;
f) Trade-mark, if any;
g) Weight of the material;
h) Lead content, Max; and
j) A cautionary note as below:

1) Keep out of reach of children.
2) Dried film of this coating chemical may be harmful if eaten or chewed.
3) This product may be harmful if swallowed or inhaled.

7.3 BIS Certification Marking

The container may also be marked with the Standard Mark.

7.3.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards

8 SAMPLING

Representative samples of the material shall be drawn as prescribed in IS 101 (Part 1/Sec 1).

Table 1 Requirements for Non Plastic, Biodegradable Polymer Based Paper Coating Chemicals

(*Clause* 6.1)

Sl No. (1)	Test (2)	Requirement (3)	Method of Test (4)
i)	Colour	Semi transparent	IS 101 (Part 4/Sec 2)
ii)	a) Consistency b) Flow Cup c) Brookfield Viscometer	Smooth, uniform, suitable for roller coating 25 to 45 sec (for Class I) 1 500 to 2 500 CPS (for Class II)	IS 101 (Part 1/Sec 5) **3** of IS 101 (Part 1/Sec 5) IS 13360 (Part 11/Sec 10)
iii)	Drying Time (Tack free)	3 to 4 h at room temperature 30 to 45 s at 70 to 80 °C	IS 101 (Part 3/Sec 1)
iv)	Finish	Smooth, Semi-gloss	IS 101 (Part 3/Sec 4)
vi)	Mass for 10 lit.	8 to 10 kg.	IS 101 (Part 1/Sec 7)
vii)	Solid Content	18 to 24 percent (w/w)	IS 101 (Part 8/Sec 6)
viii	Flash Point	Above 28°C	IS 101 (Part 1/Sec 6)

Table 2 Performance Requirements for Non Plastic, Biodegradable Polymer Based Paper Coating Chemical

(*Clause* 6.4)

Sl No. (1)	Test (2)	Requirement (3)	Test method (4)
i)	Cobb Test (g/sq.mtr./30 s)	Class I – Reduction of 30 to 40 percent of uncoated paper Class II – Reduction of 60 to 80 percent of uncoated paper.	IS 1060 (Part 5/Sec 4)
ii)	Bursting Strength (kg/sq.cm.)	Increase of strength by 10 to 15 percent in comparison to uncoated paper, for both the class.	IS 1060 (Part 6/Sec 2)
iii)	Stiffness (Taber) MD/CD	Increase by 20 to 25 percent - Class I Increase by 30 to 50 percent – Class II	IS 1060 (Part 5/Sec 8)
iv)	Co-efficient of Friction (Static)	Reduction by 15 to 20 percent - Class I Reduction by 20 to 30 percent - Class II	Annex B
v)	Tear Strength (gf) MD	Negligible Increase – Class I 15 to 20 percent increase – Class II	IS 1060 (Part 6/Sec 1)
	CD	No Change – Class I 5 to 7 percent increase – Class II	
vi)	Migration Test Extraction value (mg/sq.dm) N heptanes At 27deg.c/30 min, *Max* (*See* note)	4.5 - Class I 4.5 – Class II	IS 9845
vii)	Grease Resistance Test	Shall pass the test – (applicable for class II)	ISO 16532-1

NOTE — The extraction value is within the overall limit of 10 mg/sq.dm. as specified in Indian standard for plastics in contact with food stuff, pharmaceuticals and drinking water.

Table 3 Limits of Toxic Substances/ Chemicals in Coated Paper

(*Clause* 6.4.1)

Contaminant	Coated paper intended to come in contact with dry food (mg/kg of coated paper)	Coated paper intended to come in contact with wet food and food with fatty surface (mg/kg of coated paper)	Coated paper for filtration (mg/kg of coated paper)
Cadmium (Cd)	–	0.5	0.5
Chromium (Cr^{6+})	–	0.1	0.1
Lead (Pb)	–	3.0	3.0
Mercury (Hg)	–	0.3	0.3
Pentachlorophenol (PCP)	0.05	0.05	0.05
Poly chlorinated biphenyls (PCBS)	2.0	2.0	0.5

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No./Other Publication	*Title*
101 (Part 1/Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 1 Sampling
101 (Part 1/ Sec 5) : 1989	Methods of sampling and test for paints, varnishes and related products: Part 1 Tests on liquid paints (general and physical), Section 5 Consistency
101 (Part 1/Sec 6) : 1987	Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 6 Flash point
101 (Part 1/Sec 7) : 1987	Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 7 Mass per 10litres
101 (Part 3/Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 3 Tests on paint film formation, Section 1 Drying time
101 (Part 3/Sec 4) : 1987	Methods of sampling and test for paints, varnishes and related products: Part 3 Tests on paint film formation, Section 4 Finish
101 (Part 4/Sec 2) : 1989	Methods of sampling and test for paints, varnishes and related products: Part 4 Optical tests, Section 2 Colour
101 (Part 8/Sec 5) : 1993	Methods of sampling and test for paints, varnishes and related products: Part 8 Tests for pigments and other solids, Section 5 Lead restriction test
101 (Part 8/Sec 6) : 1993	Methods of sampling and test for paints, varnishes and related products: Part 8 Tests for pigments and other solids, Section 6 Volume solids
1060 (Part 5/ Sec 4) : 2014	Methods of sampling and test for paper and allied products: Part 5 Methods of test for paper and board, Section 4 Determination of water absorptiveness — Cobb method
1060 (Part 5/ Sec 8) : 2014	Methods of sampling and test for paper and allied products: Part 5 Methods of test for paper and board, Section 8 Determination of bending resistance — Taber-type tester
1060 (Part 6/ Sec 1) : 2014	Methods of sampling and test for paper and allied products: Part 6 Methods of test for paper, Section 1 Determination of tearing resistance — Elmendorf method
1060 (Part 6/ Sec 2) : 2014	Methods of sampling and test for paper and allied products: Part 6 Methods of test for paper, Section 2 Determination of bursting strength of paper
1303 : 1983	Glossary of terms relating to paints
1407 : 1980	Round paint tins
2552 : 1989	Steel drums (galvanized and ungalvanized)
2617 : 2006	Millboard, grey board and strawboard
4661 : 1999	Glossary of terms used in paper trade and industry
5661 : 1970	Code of practice for packing and marking of packages of paints, enamels, varnishes and allied products
9845 : 1998	Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs — Method of analysis
13360 (Part 11/ Sec 10) : 1999	Plastics — Methods of testing: Part 11 Special properties, Section 10 Resins in the liquid state or as emulsions or dispersions — Determination of apparent viscosity by the brook field test method
ISO 16532-1 : 2008	Paper and board — Determination of grease resistance — Part 1: Permeability test

ANNEX B

[*Clause* 6.4, *Table* 2, *Sl No*. (iv)]

DETERMINATION OF COEFFICIENT OF FRICTION

B-1 GENERAL

The coefficient of friction is the ratio of the frictional resistance to the normal pressure acting on two surfaces in contact. This coefficient of friction is an inverse measure of the relative ease with which the surface of one material will slide over a similar surface or over the surface of another material.

B-2 APPARATUS

The apparatus shall consist the following

B-2.1.1 A sled of 150 × 100 mm weighing 700 g with suitable eye screw at one end. The underside of the sled is covered with a 3 mm layer of microcellular rubber sheet having density of about 0.6 g/ml. The total contact area should be 140 cm^2 so that pressure exerted by the sled is 5 g/cm^2.

B-2.1.2 700 × 180 mm smooth horizontal planes on which the film can be held by a vacuum clamping device, operating through a channel around the periphery of the bed. Vacuum is applied by means of an external vacuum pump.

B-2.1.3 A motorised constant speed drive; operating on 220/240 V, 50 Hz to move the sled at a speed of 800 ± 80 mm/min over a distance of 400 mm.

B-2.1.4 A strain gauge transducer (load cell) of 1 000 g capacity.

B-2.1.5 A force meter to directly indicate the load measured by the load cell.

B-3 TEST SPECIMENS

The specimen for the plane shall be 675 mm and 255 mm. The specimen for the sled shall be 200 mm × 200 mm.

B-4 PROCEDURE

B-4.1 Place large specimen on the plane so that the longer direction of sample is parallel to the length of the plane. Apply vacuum to anchor the specimen on the plane in an unstretched wrinkle free manner. Attach the smaller specimen on the sled by folding the ends over the top of the sled and fix by cellotape. This specimen shall be attached to the sled tightly and smoothly in an unstretched and wrinkle free manner. The longer direction of the specimen shall be parallel to the length of the sled.

B-4.2 Start the constant speed drive and note the maximum load on the force meter at the start of the movement of the sled and throughout the movement of sled for up to 400 mm on the plane. This load is used to calculate the static coefficient of friction.

B-4.3 Remove the coated specimen from both the plane and sled to make the apparatus ready for next set of specimen. No specimen surface shall be tested more than once.

B-5 CALCULATION

Static coefficient of friction μ_s is given by

$$\mu_s = \frac{A}{B}$$

Where,

A = initial maximum reading, and

B = mass of the sled.

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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